3.5 WITHDRAWAL FACILITIES

3.5.1 Withdrawal Systems

TO BE PROVIDED LATER

3.5.1.1 UF_6 Withdrawal Primary System

TO BE PROVIDED LATER

3.5.1.2 Process System Pressure and Temperature Monitoring

TO BE PROVIDED LATER

3.5.1.3 Buffer System

TO BE PROVIDED LATER

3.5.1.4 Seal Feed and Exhaust System

TO BE PROVIDED LATER

3.5.1.5 Lube Oil System

TO BE PROVIDED LATER

3.5.1.6 Lube Oil System Monitoring and Alarms

TO BE PROVIDED LATER

3.5.1.7 Coolant System

TO BE PROVIDED LATER

3.5.1.8 Coolant High Pressure Relief System

TO BE PROVIDED LATER

3.5.1.9 Coolant System Monitoring Instrumentation

TO BE PROVIDED LATER

3.5.1.10 Condenser Coolant Overpressure Relief

TO BE PROVIDED LATER

3.5.1.11 Outleakage Detection

TO BE PROVIDED LATER

3.5.1.12 UF_6 Release Detection System

TO BE PROVIDED LATER

3.5.1.13 Withdrawal Station Isolation System

The Product (C-310 Building) and Tails (C-315 Building) Withdrawal Facilities are equipped with a UF_6 release detection and isolation system for the withdrawal positions. Consequences of a UF_6 release from a withdrawal facility pigtail failure are mitigated by the Withdrawal Station Isolation System as discussed in Sections 4.3.2.2.4 and 4.3.2.2.11. In the event of a pigtail failure, the system is utilized to isolate the withdrawal position to minimize the amount of UF_6 released. This system is classified as important to safety as described in Section 3.10.

3.5.1.13.1 Safety Function

Radiological/Nonradiological. The Withdrawal Station Isolation System is capable of isolating the withdrawal station to prevent exceeding the radiological/nonradiological Evaluation Guidelines (EGs) for the Evaluation Basis Event (EBE) category.

Criticality. The Withdrawal Station Isolation System, in the Product Withdrawal Facility, isolates product cylinders to preclude further releases of fissile material. Released UF_6 reacts with moisture in the air to form UO_2F_2, which further absorbs moisture from the air. UO_2F_2 and water in nonfavorable geometry have the potential to achieve criticality. This active engineered feature does not include the manual isolation system.

3.5.1.13.2 Functional Requirements

The Withdrawal Station Isolation System includes: (1) automatic UF_6 detection and isolation; and (2) manual isolation. The system is designed in accordance with the following functional requirements to ensure the capability to accomplish the required safety functions:

- The system is capable of accomplishing the required safety function independent of the plant air supply.

- The system is capable of accomplishing the required safety function independent of the normal AC power supply to the facility.

- The automatic detection and isolation portion of the system is capable of detecting UF_6 outleakage and isolating the withdrawal position pigtail at both ends.

- The automatic detection and isolation portion of the system closes the cylinder valve and isolates the withdrawal header for the station within 30 seconds after actuation of the ionization detectors.

- The manual isolation portion of the system is capable of isolating the liquid source and is accessible outside the withdrawal room.

3.5.1.13.3 System Description

The Withdrawal Station Isolation System, in the Product (C-310 Building) and Tails (C-315 Building) Withdrawal Facilities, consists of two low–voltage detectors. The low–voltage UF_6 release detectors are located above each withdrawal position, one detector located at the ceiling and one detector located directly above each withdrawal drain position and are discussed in more detail in Section 3.7.3.3. In addition, the system consists of UF_6 line isolation valves (e.g. cylinder valve and liquid drain block valves), cylinder valve motor and closure assembly, air supply piping, associated circuitry (including alarms and indicator lights), manual isolation switches, system support power, a backup nitrogen supply, and solenoid valves necessary to operate the liquid drain block valves. The Withdrawal Station Isolation System operates off the plant 120-VAC power system, which supplies 24-VDC to the detectors and initiates alarms. Figure 3.5.1.13-1 shows a typical Withdrawal Station Isolation System. A high–voltage UF_6 release detection system, located adjacent to the low–voltage detectors, activates alarms and is discussed in more detail in Section 3.7.3.1.3.

Activation of a low–voltage detector above any drain position pigtail will initiate isolation of that withdrawal position causing the following actions to occur: (1) closes the two liquid drain block valves located between the accumulators and the withdrawal pigtail; (2) closes the withdrawal cylinder valve; and (3) initiates alarms in the withdrawal area and in the respective Area Control Rooms (ACRs). Activation of any low–voltage detector at the withdrawal room ceiling will only close the liquid drain block valves for all withdrawal positions in the withdrawal room and initiate an alarm in the respective ACR.

The UF_6 line isolation valves associated with the Withdrawal Station Isolation System include air–operated liquid drain block valves (spring actuated/fail closed), cylinder valve (with an air–operated/motor driven closure assembly), and miscellaneous valves associated with the building air/nitrogen systems that support withdrawal isolation. The liquid drain block valves are diaphragm–actuated valves that require air to open and springs to close and are fail–safe. The cylinder valve is a manual valve that is equipped with an air–operated/motor–driven closure assembly. The air–control solenoid for the cylinder valve closure assembly is deenergized during activation of the isolation system. Air is then supplied to the cylinder valve closure motor, which closes the cylinder valve, isolating the UF_6 cylinder from the withdrawal position. A backup nitrogen system, provided for the cylinder valve closure assembly, activates upon failure of the plant air system. The evacuation block valves are not part of the Withdrawal Station Isolation System safety system boundary but they provide defense in depth to minimize the consequences of a failure in the withdrawal pigtail. The air–operated valves associated with the evacuation line open, allowing UF_6 to be evacuated from the pigtail to the evacuation header during automatic activation of the isolation system as described in Section 3.5.1.1.

If the automatic Withdrawal Station Isolation System fails to activate due to a failure in the system, liquid drain block valves can be closed with controls located outside the withdrawal room, in the ACR, or in the Central Control Facility (CCF). The pushbutton located immediately outside the withdrawal area closes the liquid drain block valves (those associated with the Withdrawal Station Isolation System) and the cylinder valve in all withdrawal positions within the building. The ACR and CCF have separate manual isolation pushbuttons or switches for each withdrawal position within the Product and Tails withdrawal area. These buttons also close the Withdrawal Station Isolation System liquid drain block valves and the cylinder valve.

3.5.1.13.4 System Evaluation

The Withdrawal Station Isolation System was evaluated to assess its ability to accomplish its required safety function. In addition, a qualitative fault tree analysis was performed to determine the system's capability to accomplish its safety function. The results of these evaluations are provided in this section.

Safety function analysis. The safety function required of this section is to limit the release of UF_6 and its reaction products to less than the radiological/nonradiological EGs for an EBE. A review of the withdrawal facility operations determined that the bounding event for this system is pigtail failure at a withdrawal position, described in Section 4.3.2.2.11. In order for the Withdrawal Station Isolation System to accomplish its safety function, the system must detect a UF_6 release at the withdrawal position and close the UF_6 line isolation valves before the release exceeds these guidelines. In addition, manual isolation must be capable of isolating the withdrawal station.

The hazard and accident analyses assumed that a significant UF_6 release (see Section 4.3.2.2.11) at a withdrawal position would be detected by the withdrawal position detectors within 15 seconds and the liquid source is automatically isolated (i.e., the UF_6 line isolation valves close, isolating the pigtail from the accumulator and the cylinder) within 30 seconds after initiation to close. This event was evaluated in Section 4.3.2.2.11 and the consequences were determined to be below the applicable EGs.

The manual isolation capability provides operational flexibility for conditions where the automatic detection capability is out of service. In order to assure a timely initiation of the system, continual surveillance of the withdrawal room is provided for quick detection of any releases. The environmental conditions associated with this circuitry are not significantly different, other than the "smoke" generated from the reaction of UF_6 and the moist air, from normal operation due to the short response time.

Based on this analysis, the Withdrawal Station Isolation System will prevent exceeding the radiological and nonradiological EGs for the most limiting UF_6 primary system integrity failure at a withdrawal position provided the system automatically closes the UF_6 line isolation valves within 45 seconds after the release occurs. Events where the cylinder valve cannot be closed due to the event are addressed in Section 4.3.2.2.11.

Qualitative fault tree analysis. In addition to the safety function analysis, a qualitative fault tree analysis of the Withdrawal Station Isolation System was performed in accordance with Section 4.3.1.1.3 to evaluate the capability of the system to accomplish its required safety function. The ability of the system to meet the functional requirements is described below.

As indicated in the functional requirements, the system is required to accomplish the required safety function independent of plant air and electrical supply. The system configuration can accomplish its required safety function independent of the plant air and electrical distribution system including the nitrogen bottle backup to the plant air system (valve closures). These nitrogen bottle backups are considered part of this system and are required to be tested periodically to verify their operability. Therefore, the system can accomplish its required safety function independent of plant air.

The UF_6 detectors are required for the automatic detection system. Should these detectors be determined as inoperable, a continuous smoke watch is instituted to allow for quick detection to initiate manual isolation.

In addition to the functional requirements associated with the loss of electric power and air, the automatic operation of the system is required to isolate equipment within 30 seconds after actuation of the UF_6 detectors. The analysis assumes the detectors will actuate within 15 seconds after a significant release. Past operational history with the UF_6 detectors has indicated a response time of less than 15 seconds for any significant release (see Section 4.3.2.2.11) as a result of the amount of "smoke" generated by the release. Valve closure time is verified periodically by surveillance tests to ensure the 30-second closure time is met. Therefore, the system can accomplish the required automatic detection and isolation.

The location of the manual isolation is outside the immediate area of the release with a closed door providing limited protection for the operating personnel. Therefore, the manual isolation functional requirement is also achieved by the system configuration.

Based on the capability to detect and isolate a release and the various controls associated with the system, the Withdrawal Station Isolation System can meet its functional requirements.

3.5.1.14 HEPA Exhaust System

TO BE PROVIDED LATER

3.5.1.15 Assay Monitoring System

TO BE PROVIDED LATER

3.5.1.16 Auxiliary Backup Power System

TO BE PROVIDED LATER

3.5.1.17 DC Power Distribution System

TO BE PROVIDED LATER

3.5.1.18 Support Systems

3.5.1.18.1 Electrical System

The 120-VAC power to operate the Withdrawal Station Isolation System is supplied from 480-VAC power at the motor control center. Supplied 120-VAC power is then used to develop the 24-VDC power supply for the UF_6 release detection circuit. A separate 120-VAC power circuit feeds the solenoid valves that actuate the liquid drain block valves, the cylinder valve closure assembly, and the evacuation block valves. The liquid drain block valves and the evacuation block valves are designed to close (i.e., fail–safe) upon loss of 120-VAC power. The cylinder valve is designed to close (by activation of the nitrogen backup system) upon loss of power. There are no backup power systems, since the liquid drain block valves (those associated with the Withdrawal Station Isolation System) and the cylinder valve fail closed on loss of power.

3.5.1.18.2 Plant Air System

Nominal 85-psig air is supplied from the plant air system and provides the motive power for the cylinder valve closure assembly. The cylinder valve closure assembly is also provided with a nitrogen backup system. On loss of plant air or low plant air pressure, a pressure switch on the air supply line actuates to open a solenoid valve making nitrogen available through the air supply line. The nitrogen is supplied from a portable tank in sufficient quantity and pressure to completely close the cylinder valve within 30 seconds. The nitrogen supply is isolated from the plant air system by a check valve that prevents loss of nitrogen pressure. The liquid drain block valves require air to open and are spring closed. Therefore, on loss of plant air, the valves fail in the closed position, isolating the withdrawal position from its liquid source.

3.5.1.19 System Operation

3.5.1.19.1 Operational Modes

The Withdrawal Station Isolation System is designed to be operable during the Withdrawal Mode as defined in the Technical Safety Requirements (TSR). Automatic operation of the system isolates equipment within 30 seconds after actuation of the UF_6 detectors.

Detectors are required for the automatic actuation of the Withdrawal Station Isolation System. In the event that the UF_6 release detection portion of the system fails, a continuous smoke watch is established in the affected area. If an operator detects (visually or through smell) a UF_6 release, he/she can initiate isolation of the withdrawal positions by actuating the manual isolation pushbuttons/switches. In addition, operators in the CCF can initiate isolation of all withdrawal stations at each facility by actuating hand switches.

During off–normal operating conditions, loss of plant air or loss of AC power, the liquid drain block valves fail in the closed position. The cylinder valve fails closed with either the loss of plant air or AC power. A backup nitrogen supply is provided in the event that the air supply fails.

3.5.1.19.2 Instrumentation, Controls, and Alarms

Alarms indicating Withdrawal Station Isolation System activation include indicating lights and audible devices located as follows:

- local panel or withdrawal area (C-310 and C-315 Buildings) - lights and horn
- ACR (C-310, C-315, C-331 Buildings) - lights and horn
- CCF (C-300 Building) - lights

3.5.1.20 Maintenance and Testing Requirements

TO BE PROVIDED LATER

3.5.1.21 Administrative Controls

In addition to the Administrative Controls in 4.3.2.2.4 and 4.3.2.2.11, and those controls covered by programs and plans, the following ensure safe operation of the Withdrawal Station Isolation System.

- Inspecting cylinders prior to filling for physical defects.
- Cylinder handling equipment is inspected daily (when used) for obvious defects associated with the lifting system and potential fuel/hydraulic leaks.
- No cylinder/similar weight load shall be moved over a cylinder containing liquid UF_6.
- Only approved cylinder handling equipment will be used by qualified operators for maneuvering cylinders and other heavy loads.

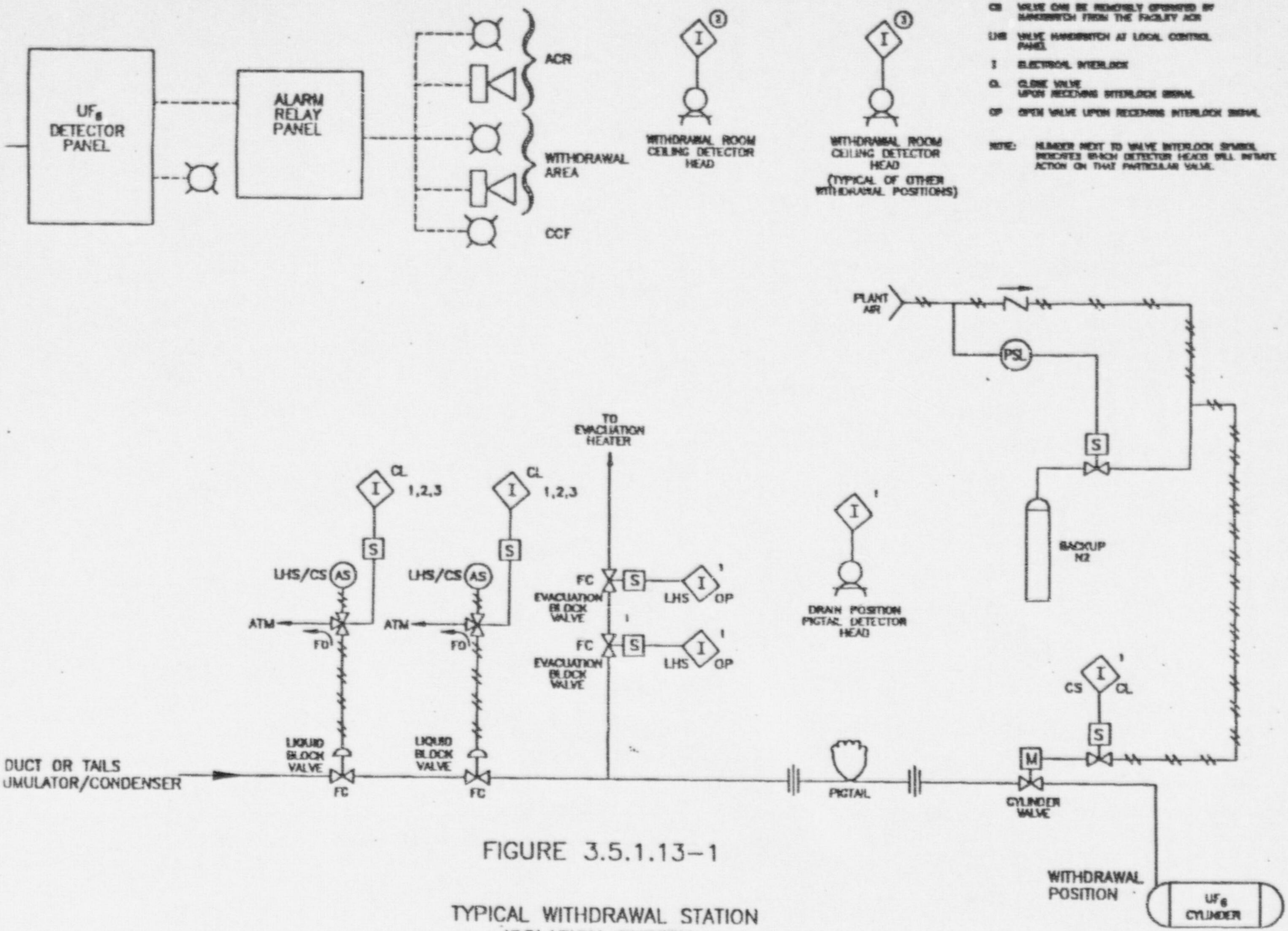

FIGURE 3.5.1.13-1

TYPICAL WITHDRAWAL STATION
ISOLATION SYSTEM
(PRODUCT AND TAILS)

3.7.5 Non-Radiological Chemical Systems

The non-radiological chemical systems produce, store, or distribute chemicals for use in the cascade process or support systems. The chemicals included in this group are fluorine (F_2), chlorine (Cl_2), hydrogen fluoride (HF), and chlorine trifluoride (ClF_3). F_2, and/or a mixture of F_2 and ClF_3, can be used in the cascade process for drying or unplugging treatments, HF is the feed material used to produce F_2, and Cl_2 is used in sanitary water treatment and sewage treatment for microbiological control. Process hazards analyses have been prepared to evaluate the risks associated with the operation of these systems and to determine the controls necessary for their safe operation. Controls established at PORTS for chemical safety are described in Section 5.6.

3.7.5.1 Fluorine Generation System

Fluorine gas (F_2), which is used for cascade equipment maintenance, is produced in the Fluorine Generation System using HF gas as the feed material. HF cylinders are delivered to the Plant by commercial motor freight. The HF cylinders are stored and the F_2 generating equipment is housed in the X-342A Feed Vaporization and Fluorine Generation Building. Fluorine generated in the system is stored in tanks in the X-342B Fluorine Storage Building. From the storage tanks, the F_2 is piped throughout the cascade and other support facilities. The Fluorine Generation System consists of HF cylinders, fluorine generators, fluorine storage tanks, associated piping and equipment, gas release detectors, and gas release detection alarm components. The Fluorine Generation System portion of the nonradiological chemical systems boundaries are defined in Table 3.10-2.

The X-342A Building, located in the north-central part of the Plant, occupies the southeast portion of the X-344A/342A complex. X-342A is a single-story, slab-on-grade, steel frame building with transite board siding. In addition to the building ventilation system, a dedicated ventilation system is provided for the Fiuorine Generation Room and the NaF Trap Room. HF detectors with automatic alarms, as well as manually-operated gas release alarms, are located in the F_2 generation areas. The building is equipped with emergency showers and eye baths, fire alarm boxes, and portable extinguishers. In addition to the F_2 system, UF_6 cylinder sampling equipment is located in X-342A. A separate high-bay part of the building contains two autoclaves with scales, cranes, and other associated UF_6 feed and sampling equipment. The F_2 process areas are separated from the UF_6 areas by concrete block and transite walls. The two F_2 headers from the storage tanks in X-342B are routed through the UF_6 high bay, and the HF cylinders are moved through the high bay area in route to the HF storage room. No other interactions occur between the two systems.

The X-342B Fluorine Storage Building is located just east of X-342A. It is a single story, slab-on-grade, steel beam structure with concrete block and transite board siding. A manually actuated exhaust fan is used to increase the ventilation rate when maintenance is performed in the building. An evacuation air jet is available for use in emptying the storage system for maintenance. The building is equipped with HF vapor detectors and a fire alarm pull box. No processes, other than the F_2 storage tanks and associated piping, are located in the building.

The HF cylinders are owned by PORTS and are filled off-site by commercial vendors. Cylinders comply with Department of Transportation specifications. The condition of the cylinders and cylinder valves are noted in the receipt inspection at X-746. Each cylinder has a capacity of 1,000 lb of HF; however, an 850-lb fill limit is imposed by PORTS to maintain a safety factor.

Plant systems that support the Fluorine Generation System are described in Sect. 3.7.5.4

3.7.5.1.1 Chemical Safety Function

The non-radiological chemical systems described in this section are important to safety. They are required to perform the following chemical safety functions:

- Maintain integrity to the process, which minimizes the potential for releasing toxic gas into the atmosphere.

- Ensure that the fluorine primary system is relieved on high pressure to minimize the potential for a failure of the primary system integrity.

- Detect releases from the primary system and provide a local alarm indication of the release.

3.7.5.1.2 Functional Requirements

The non-radiological chemical systems shall be designed and maintained for the intended service. The fluorine system pressure relief system shall be available on storage tanks that contain fluorine at pressures greater than atmospheric. The system shall actuate at or below the MAWP for the fluorine storage tank and discharge to an elevated stack. The toxic gas leakage detection system shall be designed to provide local alarm indications upon detection of releases from the primary system.

3.7.5.1.3 System Description

3.7.5.1.3.1 Equipment Descriptions and Functions

Fluorine is generated from anhydrous hydrogen fluoride. A typical HF delivery to PORTS consists of up to four cylinders, each containing up to 850 lb of HF, delivered to the plant site via commercial motor freight in protective shipping baskets. Cylinder valves are protected by steel valve covers that are hinged to allow access to the valves. The cylinders are delivered to the X-746 Materials Receiving and Inspection Facility where they are unloaded from the delivery truck, visually inspected, and placed in an adjacent storage area. When needed, up to four cylinders are moved, in their shipping baskets, to the X-342A Feed Vaporization and Fluorine Generation Building. At X-342A, the cylinders are removed from the shipping baskets by an overhead crane and placed onto wheeled dollies. The cylinders are then inspected and moved to the HF Storage Room where they are secured in place with chains. The X-342A HF Storage Room is equipped to store up to 12 full cylinders.

The primary components of the Fluorine Generation System consist of a heated cabinet in the Vaporizer Room, F_2 generators, a surge drum, sodium fluoride traps, sintered metal filters, F_2 compressors, F_2 storage tanks, and associated control valves and piping. (Fig. 3.7-*x*)

The heated cabinet is equipped with an HF detector and an air exhaust line. The cabinet walls are insulated, and interior heat is supplied by electric heaters. An air jet is provided to purge the cabinet prior to opening the access doors. Gas purged from the cabinet is exhausted outside the building through an elevated stack. The cabinet contains a mounting saddle that accommodates two HF cylinders. A slot in the HF cylinder skirt must be aligned with a peg on the mounting saddle. Otherwise, the system pigtail cannot physically be connected to the cylinder. The cylinders are secured to the saddles with chains.

Four fluorine generators, each capable of producing up to 5 lb of F_2 per hour, are located in the Generator Room. The primary components of the generators are the rectangular steel outer cell body, the electrolyte, the electrodes, the Monel inner vessel, the hydrogen collector, and the fluorine collector. The outer cell body serves as a water jacket that allows the electrolyte solution to be heated with steam or cooled with water. HF is fed from the feed cylinder at a rate sufficient to produce the desired F_2 generation rate. A typical HF feed rate is about 30 lb per hour. The generators produce F_2 by applying a high amperage DC current through the electrolyte in the presence of the HF feed gas. The net result of the reaction is the decomposition of HF to produce F_2 at the anode and H_2 at the cathode. A gas separator skirt between the electrodes prevents mixing of the H_2 and F_2 gases.

Electrostatic precipitators are installed in the F_2 outlet piping from each fluorine generator to collect any electrolyte mist or dust carryover before it can enter the system piping. An electrolyte entrainment separator is installed in the H_2 outlet piping for the same purpose.

From the generators, the F_2 flows to a 110 ft^3 surge drum in the Generator Room that helps to control the flow to the storage tanks.. The maximum operating pressure for the tank is 5 psig and the maximum operating temperature is 180 °F. At 5 psig and 80 °F, the surge drum contains approximately 14 lb of F_2.

In the event that high pressure develops in the system, F_2 can be manually vented to the atmosphere through an elevated stack. H_2 gas, which is a byproduct of F_2 generation, is normally routed through a flame arrestor and discharged to the atmosphere through an elevated stack.

From the surge drum, F_2 flows through sodium fluoride (NaF) traps and sintered metal filters located in the Trap Room. The traps and the filters are provided to remove residual HF and particulate, respectively, from the product stream. The system contains four NaF traps, any two of which can be operated in parallel. The medium in the traps is hardened NaF pellets. The system has two sintered metal filters with Monel filter elements—one normally on-line and one available as a backup.

Multi-diaphragm compressors are used to pump the F_2 to the storage tanks in X-342B. These compressors provide multiple barriers between the F_2 gas and the pump oil to prevent contamination of the F_2. Leakage of F_2 or oil through any diaphragm is detected and annunciated by audible and visual alarms located in the Control Room. Two compressors are installed in parallel. They are normally operated one at a time.

The compressors pump F_2 into the three 1,000 ft^3 F_2 storage tanks located in the X-342B Fluorine Storage Building. At a maximum normal operating pressure of 45 psig, each tank contains about 430 lb of F_2 at 30 °F. The carbon steel tanks have a maximum allowable working pressure of 194 psig and a maximum operating temperature 250 °F. Each tank is equipped with a relief device consisting of a pair of rupture discs with a nitrogen buffer in the piping between the discs. The discs are designed to rupture at 85 psig. The buffered zone is instrumented to detect and annunciate pressure changes. In the event that both discs rupture, excess system pressure is vented outside the building through a 30-ft stack. Valves in X-342B are equipped with handles on the operators so the valves can be operated from outside the building. Instrumentation for this portion of the system is also mounted on the outside wall of the building.

From the storage tanks, F_2 flows to buildings X-330 and X-333 through the black-iron header or the process gas (PG) return header. A metering station monitors the flow of F_2 to the PG return header. Double valves are used for equipment isolation to reduce the likelihood of leaks to the environment during maintenance (see Fig 3.7-x). The black-iron header normally operates at a pressure of approximately 5 psig, which is maintained by a control valve in X-342B.

Hydrogen fluoride leak detectors are located in the Building X-342A HF Storage Room; the Vaporizer Room above the vaporizer, and in the heated cabinet. HF detectors are also located above each of the fluorine storage tanks in the X-342B Building. The detectors are commercially available ionization-type smoke detectors. These detectors are suitable for F_2 leaks because the reaction of fluorine and moisture in the air rapidly produces HF, whose characteristic white smoke is readily detected by ionization detectors. Actuation of the detectors results in alarms locally and in the ACR. Refer to Section 3.7.3.4 for a description of detector system components.

3.7.5.1.3.2 Materials of Construction

Gaseous HF and F_2 are not extremely corrosive to piping. Carbon steel, stainless steel, Monel or copper are suitable materials of construction for use when no moisture is present. System piping is schedule 80 carbon steel, tanks are heavy gauge carbon steel, pigtails are copper, and valves are Monel or stainless steel.

3.7.5.1.3.3 Chemistry Requirements

The following chemicals are used or produced in the F_2 Generation System:

- Potassium bifluoride – primary electrolyte used in the F_2 generators.

- Lithium fluoride – electrolyte additive used in the F_2 generators.
- Hydrogen fluoride – feed material used to produce F_2.
- Fluorine – primary system product.
- Soda ash (Na_2CO_3) – used to neutralize equipment contaminated by contact with F_2 or HF.
- Slaked lime ($Ca(OH)_2$) – used to trap free fluorides present in the soda ash.
- Hydrogen – a byproduct of F_2 generation.

The hazards associated with these chemicals are considered to be standard industrial hazards.

3.7.5.1.4 System Evaluation

The non-radiological chemical systems are required to prevent releases of toxic gas to the atmosphere during normal operations. This safety function is accomplished by retaining system integrity during normal operations and upset events. The design requirements ensure that the primary systems can withstand the operating conditions assumed in the accident analysis and are appropriate for the chemical being used.

Primary fluorine system integrity is protected by minimizing the potential for a release of fluorine from a line at the storage tank at X-342B caused by overpressurization. A release of fluorine from a ruptured primary system could result in an uncontrolled release at ground level. The system accomplishes its safety function by relieving excessive pressure to the atmosphere through an elevated stack.

Toxic gas detectors are located in areas where a significant release of toxic gas could occur. The required safety action is to detect a release and provide local indications of the release. The safety action is accomplished by having detectors appropriate to the toxic gas present (chlorine, fluorine, etc.) and providing both audible and visual alarm indications in X-342-A and X-342-B. The system provides on-site protection for personnel by detecting a release and alerting personnel to immediately evacuate the area.

3.7.5.2 Chlorine Trifluoride

later

3.7.5.3 Chlorine System

later

3.7.5.4 Support Systems

3.7.5.4.1 DC Electrical System

DC electrical power for the F_2 generators comes from two selenium diode rectifiers, each rated at 6,000 amps at 60 V. The rectifiers are located in a room adjacent to the F_2 generators.

3.7.5.4.2 AC Electrical System

Electrical power from the plant 120 VAC system supplies the fluorine release detectors and alarms.

3.7.5.4.3 Plant Air System

Plant air is used to purge HF system pigtails, F_2 tanks, and other equipment for maintenance. Plant air also provides motive power for pneumatic valve actuators.

3.7.5.4.4 Plant Steam System

Plant steam is piped to the Fluorine Generator water jackets to keep the electrolyte warm and prevent solidification during maintenance.

3.7.5.4.5 Fluorine Generator Cooling Water

Cooling Water is supplied to the F_2 generator water jackets to cool the generator during operation. The cooling water is a closed loop, recirculating system with a collection drum and two recirculating pumps located in the F_2 Generator Room. Plant sanitary water provides makeup as needed.

3.7.5.4.6 Ventilation System

Room exhaust ventilation in the Generator Room and the Trap Room is provided by a dedicated system. The roof-mounted exhaust fan operates constantly when F_2 generation is in progress . An alarm actuates in the Control Room if the exhaust system stops. The Control Room is maintained at a positive pressure relative to the operating areas to prevent any inleakage of F_2. The X-342B Building is open to the environment. A manually actuated exhaust fan in the building is used when maintenance is being performed.

3.7.5.5 System Operation

3.7.5.5.1 Operational Modes

Operational modes for the toxic gas systems as defined in the Plant Operational Safety Analysis are:

- feed of DOT cylinders into process,
- storage/distribution of toxic gas, and
- out of operation.

The cylinder feed mode applies from the time the cylinder cap is removed to initiate the feed process until disconnection of the feed cylinder from the system is complete. The storage mode applies any time gas storage takes place, in tanks or cylinders. The system is "out of operation" when the valves connecting the system to any supply of toxic gas are closed, and the system is purged of the toxic gas such that the PrHA screening thresholds are not exceeded.

3.7.5.5.2 Instrumentation, Controls, and Alarms

The primary safety concern for the Fluorine Generation System is personnel exposure to a large leak of fluorine or HF gas. Consequently, operational instrumentation, controls, and alarms are designed to protect the system's confinement integrity.

The Fluorine Generation System is equipped with the means for emergency shutdown to protect the F_2 generating equipment and to isolate the piping and the storage tanks. The electrical circuit that powers the shutdown system is activated by any of several alarms on the control panel in the X-342A Fluorine Control Room or by either of two manual switches (on the control panel and on the outside west wall of the fluorine generator room) as follows:

- high pressure in an H_2 or F_2 cell
- high differential pressure in an H_2 or F_2 cell header
- high differential pressure between F_2 and H_2
- rectifier power overload
- rectifier cooling water pump failure
- rectifier cooling fan failure
- rectifier high temperature
- F_2 compressor shutdown (high F_2 discharge pressure)
- manual switch in the Control Room
- manual switch outside of the west wall of the F_2 generator room.

Other key operational instrumentation for the system includes a microprocessor-based controller that maintains an internal temperature of 180°F, or less, in the HF cylinder heated cabinet. The controller actuates audible and visual alarms in the X-342A Fluorine Control Room and shuts off the heaters if the internal cabinet temperature exceeds the high temperature setpoint or if the pressure in the system exceeds the high pressure setpoint.

An indicating pressure transmitter is located on the main HF feed line. This instrument indicates pressure locally and also transmits a signal to a digital indicator and alarm module in the Generator Room. System pressure is monitored by pressure switches on the fluorine and hydrogen headers. The switches activate an audible alarm and a light in the X-342A Fluorine Control Room if pressure exceeds the setpoint.

A control valve located upstream of the NaF traps protects the F_2 generating equipment from high system pressure. In the event that pressure in the F_2 distribution headers exceeds the setpoint, the valve automatically closes. A second control valve located downstream of the F_2 compressors closes on compressor shutdown to prevent distribution system pressure from reaching the F_2 generating equipment.

Each of the two cylinder pigtail connections has a pneumatic indicator located on the HF piping above the cabinet. A third pressure indicator is located in the main HF feed line. This indicator produces a digital pressure readout in the X-342A Fluorine Control Room and actuates an alarm if the high or low pressure setpoints are exceeded.

The nitrogen buffer between the rupture disks on the F_2 storage tanks is monitored by a pressure indicator and a pressure blind switch that actuates an alarm on high or low pressure. High pressure would indicate leakage through the inboard rupture disk. Low pressure would indicate leakage of the nitrogen buffer or the outboard rupture disk. If the pressure exceeds the setpoint, an alarm is actuated in the X-342A Fluorine Control Room.

Pressure blind switches are also located on the F_2 and H_2 headers that activate visual and audible alarms in the X-342A Fluorine Control Room when fluorine or hydrogen header pressure exceeds the setpoint.

Leakage of F_2 or oil through any diaphragm of the F_2 compressors is detected and annunciated by audible and visual alarms in the X-342A Fluorine Control Room.

Actuation or failure of any of the fluorine leak detectors in X-342A will result in an alarm locally and in the X-342A Control Room. In addition, manual gas release alarms are located throughout the X-342 Building. Activation of these alarms will sound the building evacuation siren. Actuation of a detector in X-342B results in audible alarms locally and in the fluorine system control room in X-342A.

3.7.5.6 Maintenance and Testing Requirements

The following maintenance and testing activities are conducted on the Fluorine Generation System due to the hazard present in the system:

- system tanks and piping are visually inspected annually,

- ultrasonic thickness tests are performed on the F_2 storage tanks every three years,
- an internal inspections of the walls and welds of the storage tanks and the surge tank are conducted every 10 years, and
- ultrasonic thickness tests are performed on the cooling/heating tubes in the fluorine generators when they are disassembled for maintenance.

3.7.5.7 Administrative Controls

Administrative controls have been implemented to minimize the potential for a leak of HF or F_2 from the Fluorine Generation System and to minimize the health effects to personnel in the event of such a leak, as discussed in the Plant Safety Operational Analysis.

- DOT-approved valve covers are in place on the HF cylinders during storage and transport.
- Only cylinder pigtails that have been inspected, approved, and tagged by a qualified inspector shall be used.
- Pigtails shall be leak tested when connected to cylinders and prior to use.
- Lines shall be purged and evacuated prior to opening the primary system.

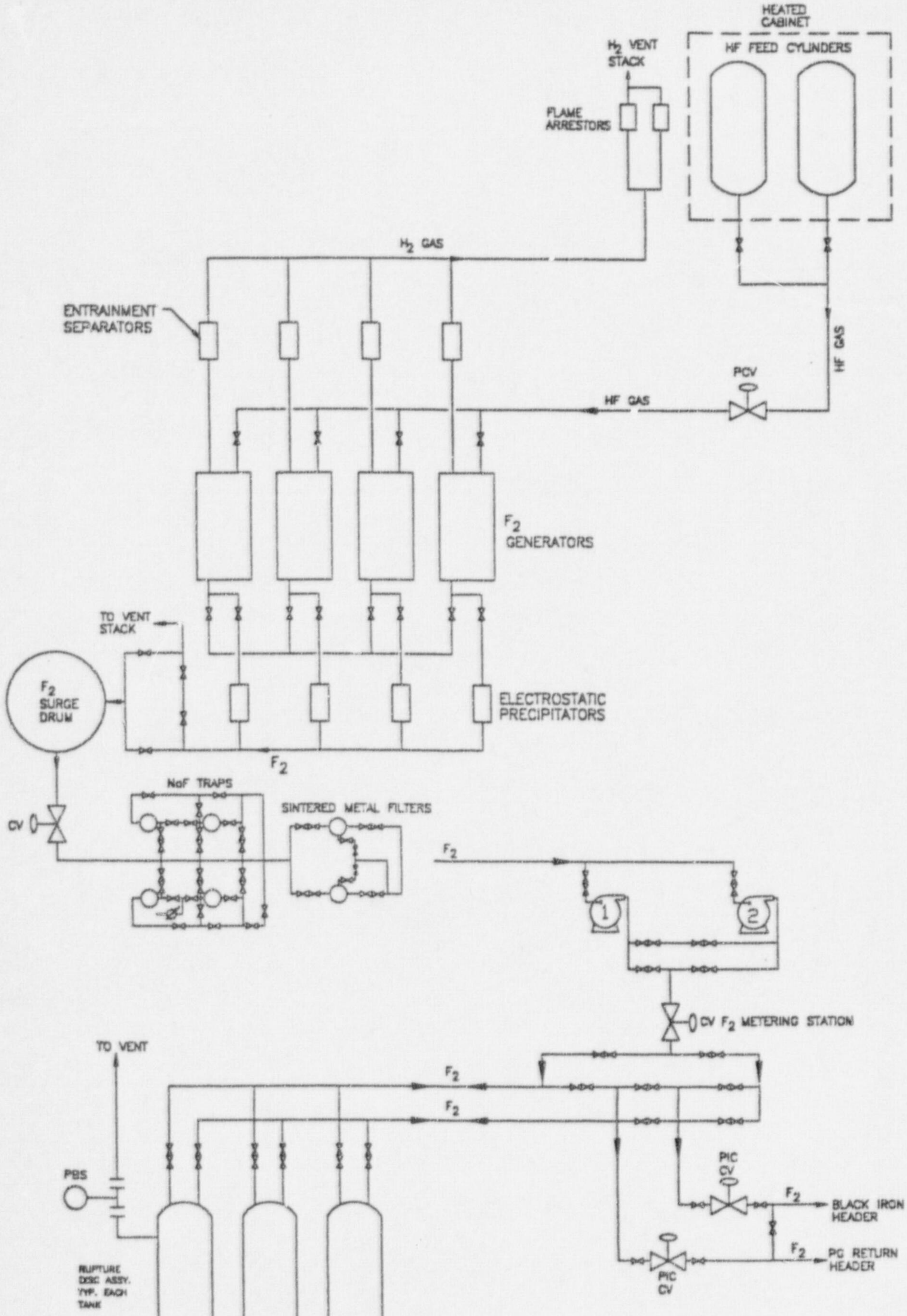

FIG. FLUORINE GENERATION SYSTEM

3.4 UF_6 FEED, TRANSFER AND SAMPLING FACILITIES

3.4.2 Autoclaves and Autoclave Systems

This section (to be provided later) contains brief descriptions of the C-333A, C-337A, and C360 autoclave facilities with references to sections 3.4.1, 3.4.3, and 3.4.4 that describe the overall facilities, the sampling systems, and the building structures and confinement systems in detail.

3.4.2.1 Autoclave High Pressure Isolation System

TO BE PROVIDED LATER

3.4.2.2 Autoclave Primary Containment System

TO BE PROVIDED LATER

3.4.2.3 Autoclave Water Inventory Control System

TO BE PROVIDED LATER

3.4.2.4 Autoclave Opening Prevention System

TO BE PROVIDED LATER

3.4.2.5 Autoclave Steam Conductivity Isolation System

TO BE PROVIDED LATER

3.4.2.6 High Cylinder Pressure System

TO BE PROVIDED LATER

3.4.2.7 Low Cylinder Pressure System

TO BE PROVIDED LATER

3.4.2.8 Autoclave Steam Pressure Control System

TO BE PROVIDED LATER

3.4.2.9 Autoclave Pressure Relief System

Each autoclave is equipped with an Autoclave Pressure Relief system to prevent the internal pressure from exceeding 110% of the maximum allowable working pressure (MAWP) as determined by Section VIII of the ASME Pressure Vessel Code. This system consists of a pressure relief valve and a rupture disc, each rated at the MAWP for the autoclave on which they are installed. The rupture disc prevents constant exposure of the pressure relief valve to steam that is present during normal operation. Such constant exposure could cause undesirable corrosion and scaling of the valve, which, in turn, could cause the valve to weep or otherwise fail to perform its design function.

Pressure above the rating of the pressure relief valve would be vented to the atmosphere through a vent line above the roof. The relief valve closes when the autoclave pressure drops below the MAWP to limit the amount of any release. Reaction products would not be released through the pressure relief valve at pressures below the set point of the valve. This relief system could only be caused to function if there were an excessive amount of water (see Section 3.4.2.3) in the autoclave at the time of a UF_6 release within the autoclave.

The pressure rupture disc performs a passive safety function as a component of the autoclave primary containment system (Section 3.4.2.2).

No support systems are required for this pressure relief system.

3.9.1 C-100 Administration Building

The C-100 administration building provides the offices for plant administration, support personnel, and the Nuclear Regulatory Commission. The building location is shown on Figure 2.1-4.

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3 Pages

Updated Chapter 3 Proposed Table of Contents

PROPOSED October 28, 1998

CHAPTER 3 TABLE OF CONTENTS

Commitments Contained in this Submittal

1. The impact, if any, on the October 31, 1999, completion date for submittal of the Chapter 3 update due to intermediate milestone date changes is currently being assessed. USEC will notify the NRC should the results of this assessment indicate a need to revise the October 31, 1999, submittal date for the Chapter 3 Update.